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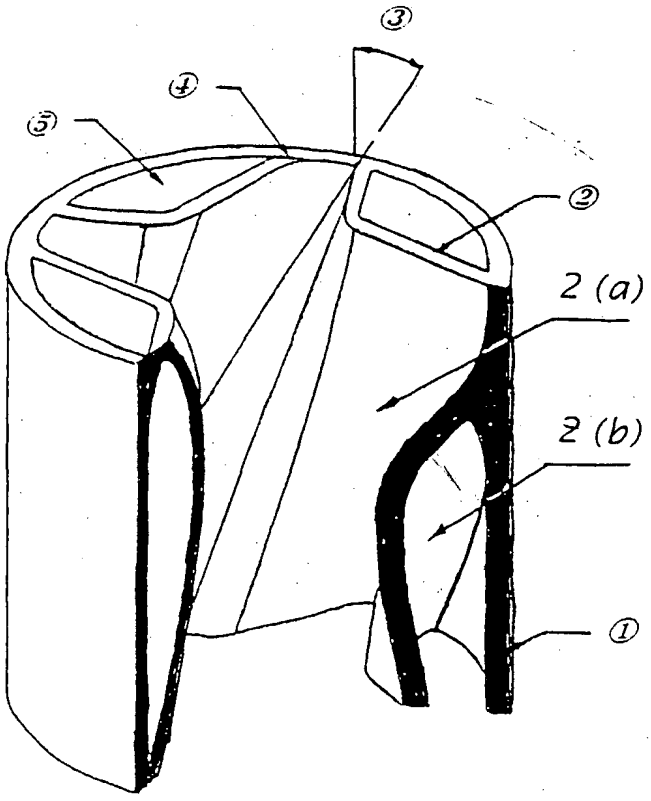
(54) Title: AIR-STIRRING BALDE FOR AN INTERNAL COMBUSTION ENGINE



(57) Abstract: Air-stirring balde for producing an agitating effect within an internal combustion engine has been disclosed in PCT/IB99/00029. The turbulency performed by the velocity of the air-fuel mixture leaving the outltet part of this device however is still low enough. The air-stirring blade of this invention comprises a cylindrical body (1) whose mid portion is provided with blade (2) of such a construction that the inner side of the blade (2a) takes the form of stirred grooves with dip angle (3) of about 10° to 80° or typically 30° with respect to vertical axis of the body. The outer side of the blade (2b) is of the same shape with the innre side (2a) thereof and there are four tangent lines (4) between blade (2) and body (1) forming a channel of cap-shaped cross-section (5) which is twisted along body (1). The preferred embodiments of this air-stirring blade as some related modifications as well.

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Description

AIR-STIRRING BLADE FOR AN INTERNAL COMBUSTION ENGINE

Technical Field of Invention

This invention relates to an inlet for air from the athmosphere into an internal combustion engine attached particularly before the engine air filter and after the combustion engine.

Background of invention

In order to be leading in current technology, an internal combustion engine mounted in automotive vehicles should reveal a good performance. To have a good performance, an internal combustion engine should have a sufficient accelereration and an optimal use of fuel. These requirements can be met by improving quality of the combustion process of air-fuel mixture within the engine.

Another way of improving the quality of combustion process of air-fuel mixture within an automotive engine is to improve the quality of air-fuel mixture. A qualified combustion process of air-fuel mixture requires that an agitating effect should occur within the mixture. An agitating effect is a phenomenon triggered and left by a stirring effect in air before the air is mixed with the fuel.

The stirring effect is recently produced by providing auxiliaries such as grooves in the air inlet. The grooves are of many types and each has its own advantage and drawback.

The prior art related to this present invention is Air-Stirring Device for Automotive Vehicles (PCT/IB99/00029).

The object of this invention is thus to improve the quality of air-fuel mixture by generating a twisting effect, maintain it as long as possible and increase the turbulency of the air-fuel mixture leaving the oulet side of the air-stirring blade.

Summary of The invention

As disclosed above, the subject of this invention is a device which enables the athmosphere flow turbulently into the engine of automotive vehicles. Compared with the prior art cited above, i.e., PCT /IB99/00029, one of the advantages possessed by this present invention is an increasing turbulency of the air-fuel mixture leaving the outlet part of this air-stirring blade due to lesser air-resistance or loss of head.

The location of this air stirring blade with carburetor within an automotive engine is shown schematically in Fig. 1. Air-stirring blade (F) is mounted after or on air channel (B) and before carburetor (C). Fig. 2 shows schematically the air-stirring blade if mounted within an internal combustion engine on channel (B) after air filter (A) and before engine combustion chamber (E) by means of an injection system.

The preferred embodiment of this invention (shown in Fig.3) comprises a cylindrical body (1).whose mid portion is provided with blade (2) constructed in such a way that the inner side of the blade (2a) takes the form of stirred grooves with dip angle (3) of about 10° to 80° or typically 30°. The shape of the outer side of the blade (2b) is the same with that of the inner side (2a) of the blade. There are four tangent lines between blade (2) and body (1). The four tangent lines form a channel with cap-shaped cross-section (5) which is twisted along body (1).

Figure 3 is a preferred embodiment of this invention whilst Figure 4 and 5 are its modifications. It can be seen from Figures 3, 4 and 5 that the air flowing from this air-stirring blade is in stirred condition enabling the occurrence of an agitating effect within the air-fuel mixture.

Brief Description of the Drawing

Figure 1 shows schematically the mounting of an air-

stirring blade within an internal combustion engine with carburetor where A, B, C, D, E are successively air filter, air channel, carburetor, intake manifold, engine combustion chamber, and air-stirring device.

Figure 2 shows schematically the mounting of air-stirring device within an internal combustion engine using an injection system, where A, B, D, E and F are successively air filter, air channel, intake manifold, engine combustion chamber, and air-stirring device.

Figure 3 is a preferred embodiment of this invention where where (1), (2), (3), (4) and (5) are successively body, blade, dip of twisting, tangent lines, and twisted channel.

Figure 4 is a modification of this invention in the form blade only, without body,

Figure 5 is other modifications of this invention where Figure 5a is an air-stirring device which is provided with lips on its body, Figure 5b is an air stirring device acting as a joint for air channel, and Figure 5c is an air stirring device which is integrally constructed with an air channel.

Figure 6 is a table showing performance of an internal combustion engine of standard type equipped successively with air twisting device disclosed in PCT/IB99/00029 and air-stirring device of present invention.

Figure 7 is a experimentally-derived graph showing the relation between fuel consumed and power yielded by an internal combustion engine of standard type, equipped with air twisting-device disclosed in PCT/IB99/00029, and equipped with air-stirring device of present invention, respectively.

Detailed Description of the Invention

The purpose of this invention is to improve the performance of an automotive engine without any significant changes in the previous design of the engine. A satisfied result in the form of a well stirred air flowing into the automotive engine can be performed by optionally attaching an air-stirring device on the engine.

Air-stirring device that can be attached without necessarily changing the engine construction has been disclosed in PCT/IB99/00029.

The turbulency of the air-fuel mixture leaving the outlet part of the air-stirring device disclosed in PCT/IB99/00029 is considerably lower than that of this invention.

Based on that fact, the aim of this present invention is thus to insure as well as to increase the turbulency of the air-fuel mixture leaving the outlet part of the device disclosed in PCT/IB99/00029 by means of a twisted air channel (5) attached on the solid portion of the air-stirring device disclosed in PCT/IB99/00029.

The attachment of the air-stirring device presently invented on an internal combustion engine is shown in Figure 1. This air-stirring device (F) is attached after the air channel (B) or on the air channel (B) but before the carburetor (C). Such position of attachment is intended to provide an airflow which has been twisted before entering the carburetor (C). Since the air has been twisted before entering the carburetor (C), the air-fuel mixture entering the engine combustion chamber (E) will have been twisted as well and agitated. To achieve an optimal agitating effect, this air-stirring device (F) is attached in an internal combustion engines not on one place only, but on other places as well such as on the air channel (B) or in the front of intake manifold (D).

The preferred embodiment of this invention (shown in Figure 3) comprises a cylindrical body (1) provided with blade (2) which is shaped in such a way that the inner side of the blade (2a) takes the form of stirred grooves with dip angle (3) of about 10° to 80° or typically 30° with respect to vertical axis of the body. The the outer side of the blade (2b) is of the same shape with the inner side (2a) thereof. The four tangent lines between blade (2) and body (1) form a channel of cap-shaped cross-section (5) which is twisted along body (1). The number of tangent lines (4) between body (1) and blade (2) is dictated by the number of groove performed on the

blade (2); it is not always four as cited above. The minimum number of groove is usually two but more grooves are allowed when needed.

Tests are conducted by comparing measured parameters of an internal combustion engine mounted on powered vehicles using injection system on standard condition (without air-stirring device), using air-stirring device disclosed in PCT/IB99/00029, and using the air-stirring blade presently invented. The parameters were measured for each condition under specified rpms of the internal combustion engine. Parameters observed in the test is the time needed to use up a 25 ml fuel, the engine rpm at that time and the related power of the engine. Power is measured by dynamometer.

The data obtained are tabulated in Figure 6. The fuel consumed per second calculated from data shown in Figure 6 is then interrelated to the power of the engine. The graph produced is shown in Figure 7.

Figure 7 shows that to produce the same power at all rpms the internal combustion engine equipped with the air-stirring blade presently invented consumes less fuel than the same engine equipped with air-stirring device disclosed in PCT/IB99/00029 and the internal combustion engine equipped with nothing. With respect to PCT/IB99/00029, at rpms below 3500, the internal combustion engine equipped with air-strirring blade presently invented consumes less fuel to produce power of the same rate. However at rpm of 1500, the internal combustion engine equipped with air-stirring blade presently invented and the internal combustion engine equipped with the device disclosed in PCT/IB99/00029 consume fuel of the same amount.

Figure 3 is a preferred embodiment of this invention whilst Figure 4 and 5 show modifications thereof. Modification in Figure 4 is in the form of blade (2) only following the omission of the cylindrical parts of its body (1). Modification in Figure 4 is possible if the air-stirring blade acts as an inserting part and body (1) of the air-stirring blade is of such construction that it looks to be integrated

with the air channel within the internal combustion engine.

Figure 5a shows another modification of this invention where body (1) is equipped with additional lip (6).

Figure 5b is another modification of this invention in which the blade acts a a joint for air channel, and Figure 5c is an air-stirring device which is integrally constructed with the body of an air channel.

Most of those modifications are made of nonmetal materials such as polymer. Only a few of them are made of metal.

It should necessarily be understood that the scope of this invention is not limited by the embodiments represented by the appended drawings. All modifications made by the people skilled in this art are still part of this invention as long as the principles underlying the modifications still exist within the scope of the invention.

Claims

1. An air-stirring blade to be mounted within an internal combustion engine, characterized by

a cylindrical body (1) whose mid portion is provided with blade (2) constructed in such a way that the inner side of the blade (2a) takes the form of stirred grooves with dip angle (3) of about 10° to 80° or typically 30° with respect to vertical axis of the body; and

the outer side of the blade (2b) which is of the same shape with the inner side (2a) thereof, the existence of two or more, generally four tangent lines (4) between blade (2) and body (1) which form a channel of cap-shaped cross-section (5) which is twisted along body (1).

2. Air-stirring blade in claim 1 whose shape has been modified so as to show a blade (2) only after the omission of the cylindrical parts of its body (1).

3. Air-stirring blade in claim 1 which is modified as a body (1) equipped with additional lip (6).

4. Air-stirring blade in claim 1 which is modified in such so that the blade is integrally constructed with the air channel and acts a joint for air channel.

5. Air-stirring blade in claim 1 which can be made of nonmetal materials such as polymer or metal.

AMENDED CLAIMS

[received by the International Bureau on 19 April 2002 (19.04.02); original claims 1-5 replaced by new claims 1-6 (1 page)]

1. An air-stirring blade to be mounted within an internal combustion engine, characterized by,

a cylindrical body (1) whose mid portion is provided with blade (2) constructed in such a way that the inner side of the blade (2a) takes the form of stirred groves with dip angle (3) of about 10° to 80° or typically 30° with respect to vertical axis of the body, **and this blade makes a twisted center tunnel as inner passage;** and

the outer side of the blade (2b) which is of the same shape with the inner side (2a) thereof, the existence of two or more, generally four tangent lines (4) between blade (2) and body (1) which form channel of cap-shaped cross section (5) which is twisted along body, **as outer passage.**

2. Air-stirring blade in claim 1 whose shape has been modified so as to show a blade (2) only after the omission of the cylindrical parts of its body (1)

3. Air-stirring blade in claim 1 which is modified as a body (1) equipped with additional lip (6)

4. Air-stirring blade in claim 1 which modified in such so that the blade is integrally constructed with the air channel and acts a joint for air channel.

5. **An air-stirring blade to be mounted within an internal combustion engine, characterized by,**

a blade (2) constructed in such a way that the inner side of the blade (2a) takes the form of two or more of coiled grooves with each coiled grooves has dip angle (3) of about 10° to 80° or typically 30° with respect to vertical axis of the body, and this blade makes a twisted center tunnel as inner passage; and

the outer side of the blade (2b) which is of the same shape with the inner side (2a), and if inserted to the air duct will has tangent lines (4) between blade (2) and air duct which form channel which is twisted along body of air duct, as outer passage.

6. Air-stirring blade in claim 1 **and claim 5** which can be made of nonmetal materials such as polymer or metal.

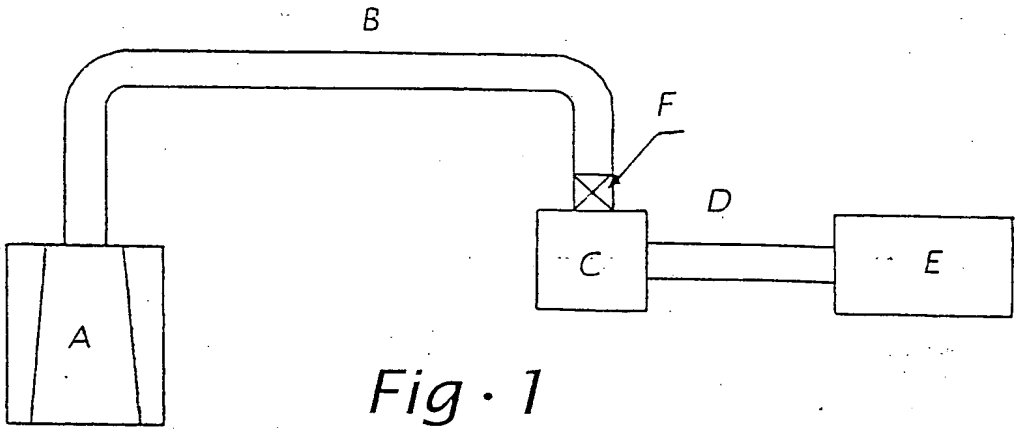

Fig · 1

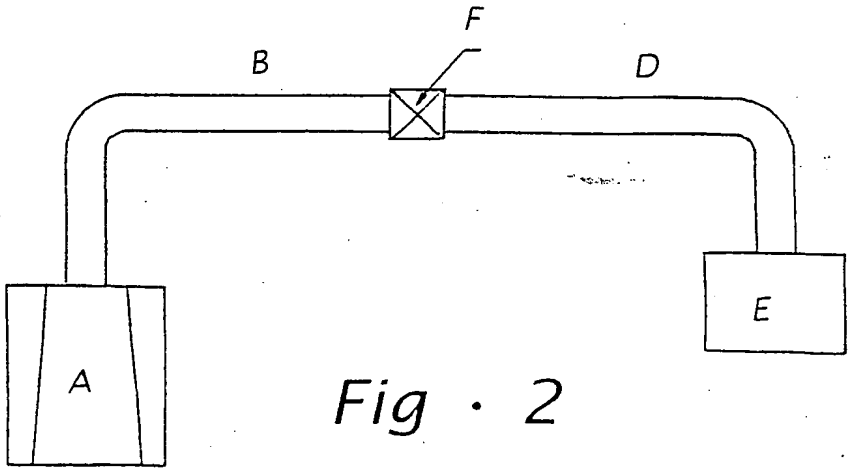

Fig · 2

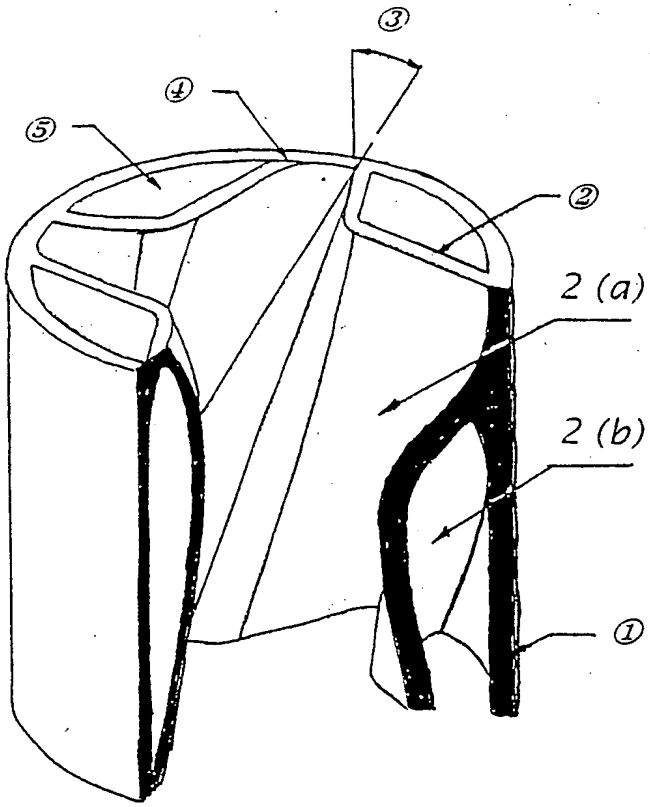

Fig · 3

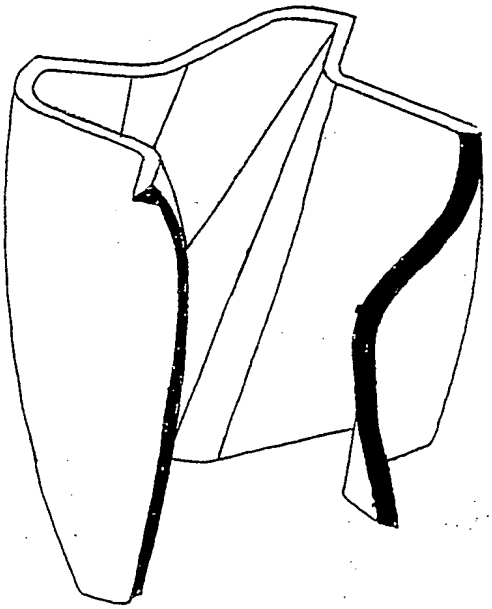

Fig · 4

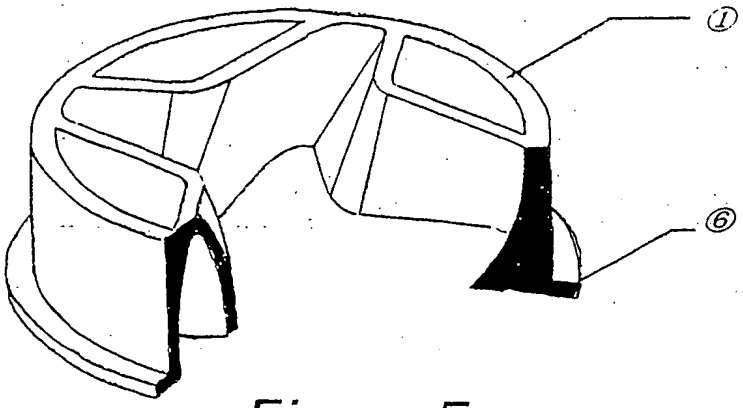

Fig · 5a

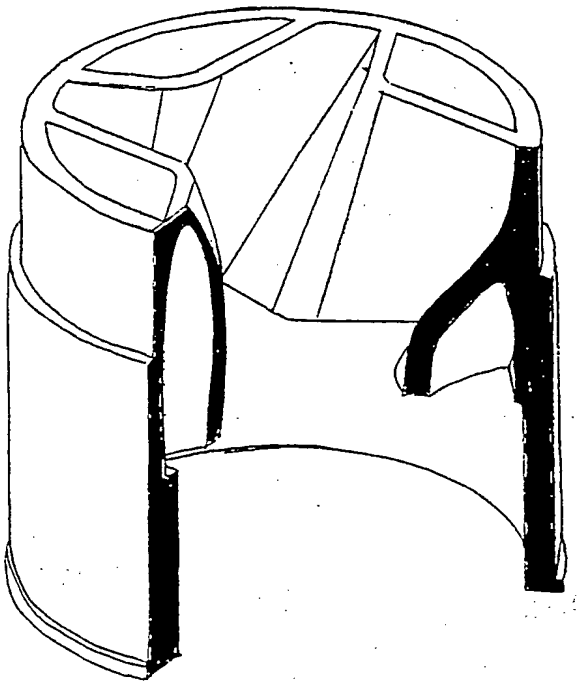

Fig · 5b

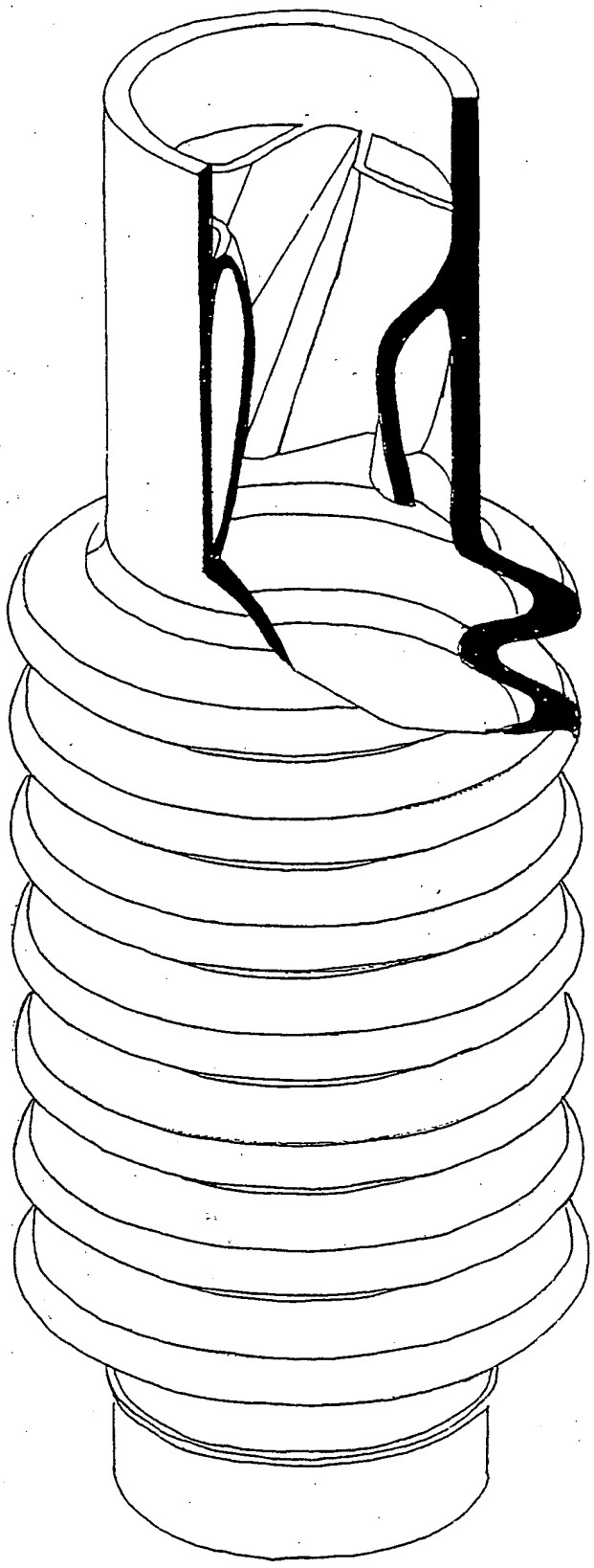

Fig · 5c

Test results showing the relation between fuel consumed (in secs) and power produced (in hp) by an internal combustion engine using three different types of air-twisting device

No	Machine rpm	Standard		PCT/IB99/0029		New Invention	
		Power (hp)	Fuel (Sec)	Power (hp)	Fuel (Sec)	Power (hp)	Fuel (Sec)
1	1.000	2	48.16	3	51.05	4	68.20
2	1.500	15	24.78	15	46.58	17	37.16
3	2.000	25	13.99	26	19.91	26	31.60
4	2.500	35	8.63	38	15.35	41	18.73
5	3.000	49	6.66	50	10.68	56	14.54
6	3.500	67	5.55	66	8.57	73	7.41
7	4.000	81	4.90	82	6.01	91	4.96
8	4.500	101	3.37	102	3.39	99	3.34

- *Fuel in secs refers to the time needed to use up a 25 ml bulb*
- *Power Produced is power transmitted by wheel to dynamometer*

Fig · 6

Graphs showing the relation between normal fuel consumption and power

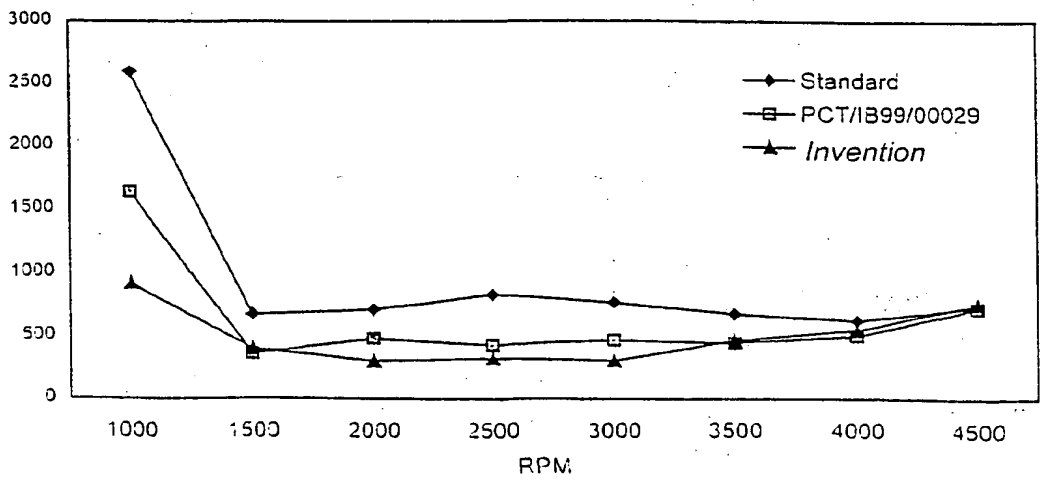

Fig · 7

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 395 899 A (KOPA RICHARD D) 6 August 1968 (1968-08-06) column 5, line 58 -column 11, line 74; figures 1,3	1-3
X	BE 347 113 A (G ROMEDENNE) 31 January 1928 (1928-01-31) page 1, line 1 -page 3, line 21; figures 1,2	1-4
A	WO 00 06889 A (WIJAYA HERU PRASANTA) 10 February 2000 (2000-02-10) page 2, line 6 -page 3, line 30; figure 1B	1-5

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 395 899 A (KOPA RICHARD D) 6 August 1968 (1968-08-06) column 5, line 58 -column 11, line 74; figures 1,3	1-3
X	BE 347 113 A (G ROMEDENNE) 31 January 1928 (1928-01-31) page 1, line 1 -page 3, line 21; figures 1,2	1-4
A	WO 00 06889 A (WIJAYA HERU PRASANTA) 10 February 2000 (2000-02-10) page 2, line 6 -page 3, line 30; figure 1B	1-5

INTERNATIONAL SEARCH REPORT

International Application No
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